SCHIZOPHYLLUM COMMUNE AS NANO-FACTORY FOR BIOSYNTHESIS OF SILVER NANOPARTICLES

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Introduction

Silver nanoparticles (AgNPs), are the noble metal nanoparticles that are being studied extensively due to their antimicrobial properties[1]. Green synthesis is favorable because chemical synthesis posed potential environmental and biological risk[2]. Green synthesis involved various species including bacteria strains, fungi strain, and actinomycete[3] which are well known to be capable of synthesizing AgNPs. The purpose of this paper is to describe the synthesis of AgNPs by *Schizophyllum commune,* one of the white rot macro fungi obtained in Malaysia rainforest which is less reported. Characterization of the metals produced will also be looked at.

Materials and Methods

Biosynthesis of silver nanoparticles

White macro fungus, *Schizophyllum commune* was obtained from the culture collection of Forest Research Institute of Malaysia (FRIM). The culture was grown in a cultivation media using the method as described by Bhainsa and Souza[4] for 120 hrs. The harvested mycelium and culture supernatant were inoculated into 0.001M of silver nitrate and incubated in a shaker for 5 days.

Characterization of silver nanoparticles

The synthesis of AgNPs was monitored by visual inspection of the flasks for a change in the color of the reaction medium from a clear to yellowish brown, and by measurement of the peak exhibited by AgNPs in the UV-vis spectra where the synthesis of AgNPs was confirmed. The particles size distributions were then determined using a Zetasizer Nano ZS (Malvern Instruments, Southborough, UK). TEM (EFTEM LIBRA 120) was used for size and shape of the AgNPs synthesis intracellularly and extracellularly.

Results and Discussion

Biosynthesis of silver nanoparticles (AgNPs)

Bioreduction of silver nitrate into AgNPs can be examined using UV-vis spectroscopy indirectly[5]. In the present study, the color of the silver nitrate solution in the flask containing pellets of *S. commune* changed from colorless to grayish yellow. The changes in color indicated the formation of AgNPs.

Characterization of AgNPs

The AgNPs were primarily characterized using UV-vis spectroscopy. Figure 1 show the spectra for the extracellular AgNPs synthesis when silver nitrate reacts with the pellets of *S. commune* as a function of reaction time. It is observed that the silver surface plasmon band occurs at absorption intensity 400-450 nm, followed by an increased in intensity as the reaction time proceed. According to Henglein [6], the occurrence of peak at absorption intensity between 400-450 nm indicated the presence of surface plasmon, which reflected the presence of AgNPs with size between 2 nm to 100nm.

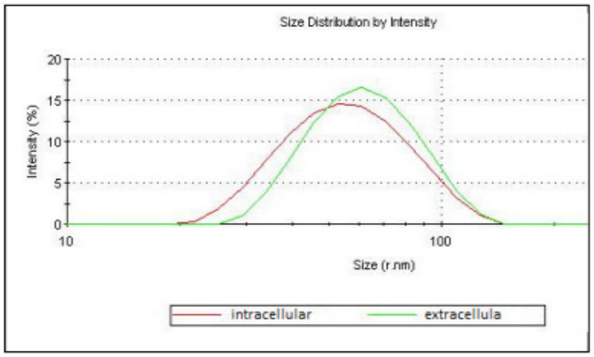

Fig. 1. UV-vis spectrum of the reaction mixture consisting of 0.001 M silver nitrate added with pellets of *S. commune*.

Fig. 2 shows the UV-vis spectrum of the reaction mixture consisting of 0.001 M silver nitrate added with pellets of *S. commune*. The particles size distributions of AgNPs synthesis by *S. commune* were 42.12 nm and 38.2 nm for the extracellular and intracellular, respectively. These results are in similar lines with earlier studies indicating that the formations of AgNPs are of diameter less than 100 nm[6]

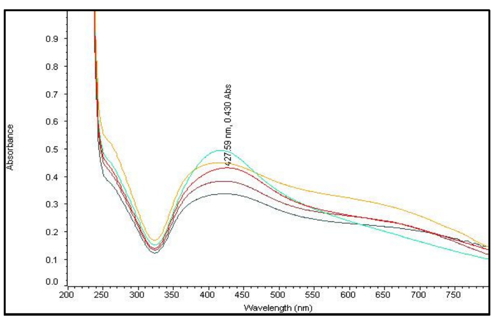

Fig. 2 Particle size distributions of silver nanoparticles synthesized by *Schizophyllum commune* after 48 h incubation.

The TEM micrograph showed that AgNPs that were synthesized extracellularly form small spheres and appeared to be reasonably monodisperse, while the intracellular showed that the synthesis was mostly along the circumference of the fungal mycelium. Similar observation was also reported by Pandian[7] who stated that the cell membranes act as a place for the respiratory nitrate reductase to react for the bioreduction of silver.

Conclusion

This study showed that *Schizophyllum commune* has shown to be a potential white rot fungus capable of synthesizing both extracellular and intracellular monodispersed AgNPs.

References

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